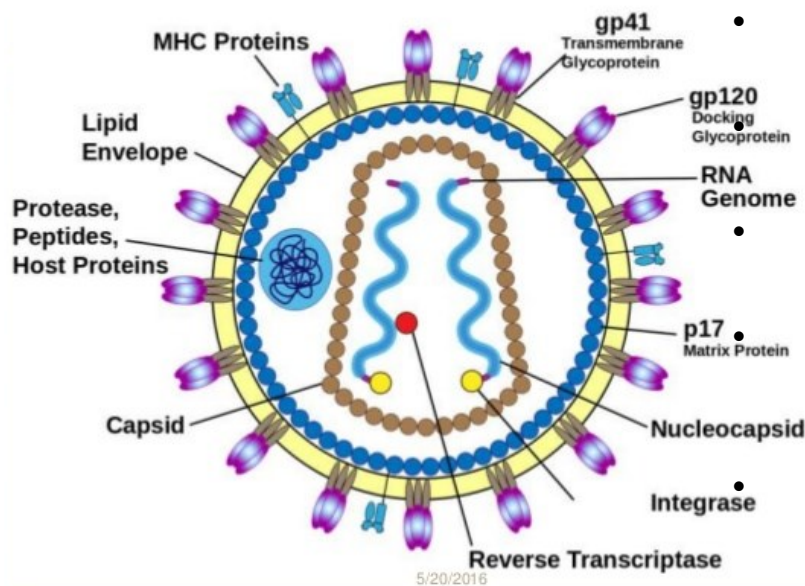


HIV

The human immunodeficiency virus (HIV) causes the disease AIDS (acquired immune deficiency syndrome). First diagnosed in 1981.

Structure of HIV:

On the outside is a lipid envelope, embedded in which are peg-like attachment proteins. Inside the envelope is a protein layer called the capsid that encloses two single strands of RNA and some enzymes. One of these enzymes is reverse transcriptase = catalyses the production of DNA from RNA.



Replication of HIV:

Being a virus, it cannot replicate itself. It uses its genetic material instead to instruct the host cells biochemical mechanisms to produce the components required to make new HIV:

- Following infection, HIV enters bloodstream and circulates body
- A protein on the HIV readily binds to a protein called CD4 while this protein occurs on a number of different cells. HIV most frequently attaches to helper T cells

The protein capsid fuses with the cell-surface membrane. The RNA and enzymes of HIV enter the helper T cell

- The HIV reverse transcriptase converts the viruses RNA into DNA.

The newly made DNA is moved into the helper T cells nucleus where its inserted into the cells DNA.

- The HIV DNA made in the nucleus creates mRNA using the cells enzymes.

The mRNA passes out of the nucleus through to a nuclear pore and uses the cells protein synthesis mechanisms to make new HIV particles.

These break away from the helper T cell with a piece of its cell-surface membrane surrounding them which forms their lipid envelope.

How it causes AIDS:

The virus specifically attacks helper T cells. It causes AIDS by killing or interfering with the normal functioning of helper T cells. An uninfected person normally has between 800 and 1200 helper T cells in each mm³ of blood. In a person suffering from AIDS, it can be as low as 200mm⁻³. body is unable to produce an adequate immune response and becomes susceptible to other infections and cancers. Many sufferers develop infections of the lungs/intestines/brain and eyes/ weight loss and diarrhoea.

The ELISA test:

Enzyme linked immunosorbent assay. Uses antibodies to detect the presence of a protein in a sample but also the quantity. Extremely sensitive and so can detect very small amounts of a molecule.

Why antibiotics are ineffective against viral diseases:

Antibiotics like penicillin inhibit certain enzymes required for the synthesis and assembly of the peptide cross-linkages in bacterial cell walls. This weakens the walls, making them unable to withstand pressure. As water enters naturally by osmosis, the cell bursts and the bacterium dies. Viruses rely on host cells to carry out their metabolic activity and lack their own metabolic pathways and cell structures = no metabolic mechanisms or cell structures to disrupt/ don't have a murein cell wall = no sites where they can work.